

Accepted Manuscript

Temperature dependent time resolved mid-IR photoacoustic spectroscopy of a nerve gas simulant DMMP

K.S. Rao, A.K. Razdan, Akansha Tyagi, A.K. Chaudhary



PII: S1386-1425(18)30631-0
DOI: [doi:10.1016/j.saa.2018.06.089](https://doi.org/10.1016/j.saa.2018.06.089)
Reference: SAA 16248

To appear in: *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*

Received date: 11 January 2018
Revised date: 18 May 2018
Accepted date: 23 June 2018

Please cite this article as: K.S. Rao, A.K. Razdan, Akansha Tyagi, A.K. Chaudhary , Temperature dependent time resolved mid-IR photoacoustic spectroscopy of a nerve gas simulant DMMP. Saa (2018), doi:[10.1016/j.saa.2018.06.089](https://doi.org/10.1016/j.saa.2018.06.089)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Temperature dependent time resolved Mid-IR photoacoustic spectroscopy of a nerve gas simulant DMMP

K.S. Rao ^{1,3}, A.K. Razdan ², Akansha Tyagi ² and A.K. Chaudhary ^{1*}

1. Advanced Center of Research in High Energy Materials (ACRHEM), University of Hyderabad, Hyderabad-500046, India

2. Laser Science & Technology Centre (LASTEC), Delhi 110054, India

3. The Guo China-US Photonics Laboratory, Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences, Changchun, China.

* E-mail: anilphys@yahoo.com, akcphys@gmail.com

Abstract: The paper reports the temperature dependent pulsed photoacoustic spectroscopy of Dimethyl methylphosphonate (DMMP) a nerve gas simulant between 50- 180 ° C temperature range. The time domain PA spectra are recorded using two mid-IR wavelengths i.e. 3374 nm, 3495 nm of pulse duration 1.5 ns at 1 kHz repetition rate obtained from optical parametric oscillator. Two anti-symmetric stretching vibrational modes of (CH₃P) and (CH₃O) groups of DMMP molecules have very strong vibrational peaks at 2861.2 cm⁻¹(3495 nm) and 2963.8 cm⁻¹(3374 nm), respectively. In addition, we have also recorded the PA spectra of acetone at the vibrational frequency 3115.2 cm⁻¹ (3210 nm), which is the strong vibrational mode of CH band. The comparison of two PA spectra of DMMP and acetone recorded using similar PA cavity help us to understand the effect of other functional groups with respect to different excitation wavelengths. The presence of additional acoustic modes in the PA spectra of DMMP (3374 nm) above the boiling point confirms the slow process of thermal decomposition. Finally, the low level detection limit of DMMP in air is of the order of 0.91ppbV.

Keywords: OPO, DMMP, Photoacoustic, Laser, IR-bands

Download English Version:

<https://daneshyari.com/en/article/7667825>

Download Persian Version:

<https://daneshyari.com/article/7667825>

[Daneshyari.com](https://daneshyari.com)